gentle and unassuming character endeared him to his many intimate friends and pupils. His personal charm was greatly enhanced by a keen sense of humour; he delighted in a good story. In conversation Minchin was gifted with a happy turn of phrase. His friend, Mr. Heron-Allen, with whom he spent his last days, tells us that in answer to a quotation from O. W. Holmes, that "Life, as we call it, is nothing but the edge of the boundless ocean of existence where it comes on soundings," Minchin replied, "And death, as we call it, is nothing but the unfathomed deeps of the ocean of existence where we lose the sounding plumb."

DR. T. ALBRECHT.

We deeply regret to announce the death, on August 31, at seventy-two years of age, of Dr. Theodor Albrecht, departmental chief in the Royal Prussian Geodetic Institute, Potsdam, and chief of the International Bureau for Investigating Latitude Variation since its inception in 1898. By his death, geodesy loses a painstaking and conscientious worker, who laboured zealously to unravel a complicated problem, and to carry forward the investigations so brilliantly inaugurated by the late Dr. Chandler. For many years he occupied himself with the study of the minute changes in the position of the earth's axis, and by his office had been mainly responsible for the methods of observation applied, and the trustworthiness of the results derived.

Prof. Fergola, as is well known, urged the necessity of attacking this question of latitude variation by a uniform and systematic method of observation under international control, so far back as 1883, but it was not until twelve years later that any progress was made, when Profs. Forster and Helmert, supported by the hopeful researches of Chandler, were able to bring the far-reaching scheme to fruition. From that time onward, Albrecht was identified with this plan, to which he gave untiring devotion. Even before his appointment as director, he had signalled his interest in these researches by dicussing the motion of the pole in the interval 1890–95, from observations made at some dozen observatories in Europe and America. Since then Dr. Albrecht issued reports with praiseworthy regularity, and his diagrams showing the excursions of the pole have been models of clearness. Under his superintendence the bureau justified itself by its diligent, patient labour and skill in handling minute details. Criticism has not been wanting, but probably there was little room for originality or brilliancy of treatment.

The late director performed a useful work in keeping an interesting problem before the scientific world, and though in these days there must be great difficulty in maintaining an international bureau, supported by the varying subsidies of many nations, amounting in all, we believe, to about 3000*l.* per annum, it would be a matter of regret if any breach of continuity in the conduct of the bureau should result.

NOTES.

At the recent meeting in Manchester, the General Committee of the British Association unanimously adopted the following resolution, which has been forwarded to the Prime Minister, the Chancellor of the Exchequer, and the Presidents of the Board of Education and of Agriculture and Fisheries:—"That the British Association for the Advancement of Science, believing that the higher education of the nation is of supreme importance in the present crisis of our history, trusts that his Majesty's Government will, by continuing its financial support, maintain the efficiency of teaching and research in the universities and university colleges of the United Kingdom."

The urgent need for a wise economy in every department of public and private life is recognised by every patriot anxious to see the war brought to a successful end. A timely protest in the Press from Sir James Yoxall, M.P., against unintelligent and wrongly directed economy deserves notice. At no time in the country's history has it been more necessary that every effort should be made to make our system of education efficient and thorough, so that when military conflict gives place to industrial competition we may be able to hold our own with the central European States. Yet Sir James Yoxall has to direct attention to attempts to save money at the expense of the education of the nation's children. "Supplies of books, stationery, and other needed school appliances are being lessened in amount or reduced in quality; plans are laid for abolishing evening classes and schools; and there is evidence of a wide general slackening in educational provision." Some local education authorities have contemplated reducing the salaries of teachers. "The Amalgamated Association of Operative Cotton Spinners, operatives themselves, and many of them parents, are asking that children may go into the mills to work full time at the age of thirteen. Agricultural people demand 'half-time' for children of eleven; and so does the Cotton Spinners' Trade Union, I understand." Such unwise economy must be discouraged everywhere, and it is the duty of every influential person to do his part to prevent any deterioration in the work of our schools and colleges, because upon it our country's welfare ultimately depends.

Mr. E. W. Swanton has been elected president of the British Mycological Society.

The Thomas Hawksley Lecture of the Institution of Mechanical Engineers will be delivered on Friday, October 29, by Dr. Dugald Clerk; the subject will be, "The World's Sources of Fuel and Motive Power."

A preliminary meeting to discuss the formation of a proposed Society for the Study of Geological Physics will be held at the rooms of the Geological Society of London, Burlington House, W., on Thursday, October 14, at 3.30 p.m. The chair will be taken by Prof. Benjamin Moore.

The issue of *Science* for September 17 announces the death of Prof. Karl E. Guthe, professor of physics in the University of Michigan and dean of the

Graduate School; and of Prof. J. H. Van Amringe, dean of Columbia College, and professor of mathematics until his retirement five years ago after a service of fifty years.

THE Rome correspondent of the *Morning Post* states that in consequence of comments on his Germanophil attitude, the Marquis Cappelli has resigned the presidency of the Royal Geographical Society of Italy, and the resignation has been accepted. As the Marquis Cappelli is also president of the International Agricultural Institute, the question is being asked whether he will now retain that position.

THE director of the Meteorological Office reports that information has been received from the seismological observatory at Eskdalemuir, Langholm, Scotland, of the record of a large earthquake which occurred at 7 a.m. G.M.T. on Sunday, October 3. The computed position of the epicentre is between Colorado, U.S.A., and the Island of Guadelupe, off the coast of California.

WE learn from the *Pioneer Mail* that the programme of the Board of Scientific Advice for India during the year 1915–16 includes the following work of the various scientific departments:—The meteorological department will continue observational work with pilot balloons at various stations, and will also do some experimental work on vertical air currents at Agra. In the astronomical department a new spectroheliograph is under construction, which it is hoped will be completed during the year. Five Omori seismographs, two at Simla, two at Calcutta, and one at Bombay, the Milne seismograph at Kodaikanal, and several instruments of local manufacture at Bombay, will be kept in use during the year for scientific research work. Geological surveys will be continued in Bombay, Central India, Rajputana, the Central Provinces, Burma, and Kashmir. In connection with the botanical survey of the country, the curator of the herbarium and the systematic assistants will work up, with a view to publication, the material of the past year's exploration in Southern India, and the material presented by contributors not belonging to the department for field work. It is proposed to continue the exploration of Travancore by the curator of the herbarium and an officer of the department. This field work will be of practical use in connection with the flora of Madras now under preparation. In the industrial section of the Indian Museum plant breeding and plant improvement work will be continued on wheat, tobacco, gram, fibre plants, indigo and oilseeds; and fruit entomology will include general investigations of crop pests, and especially of the pests of rice, sugar-cane and cotton, fruit trees, and stored grain. Under the head of agriculture, the following are among the lines of work in progress:—The combination of irrigation and drainage in the growing of rice; the study of the inheritance of the more important characters of dairy cattle by crossing; the building up of milk pedigree in cattle by selection.

THE Rev. Cyrus Byington, born in 1793, served for fifty years as a missionary among the Choctaw Indians, and died full of years and honour in 1868. He translated into Choctaw several books of the Old and New Testaments, and compiled a grammar of the language. His chief work was a Choctaw-English Dictionary, which he left in manuscript without final revision. This has now been done by Mr. J. R. Swanton with the assistance of Mr. H. S. Halbert, who spent many years among the Choctaws, became familiar with their language, and is an enthusiastic student of everything relating to the past history and present culture of the tribe. The dictionary, which has now been published as Bulletin 46 of the Bureau of American Ethnology, will be welcomed by all students of the languages of the American Indian tribes.

IN *Man* for October, Mr. T. E. Peet discusses the types of megalithic monuments found in the peninsula of Sinai, which are interesting in connection with the question of rude stone monuments in the Mediterranean basin, and also in view of a possible relation between their builders and the early Egyptians. The monuments consist of beehive tombs, rock circles, and hut circles. Much further investigation is needful before their origin and relations can be fixed with certainty. Mr. Peet, who writes with commendable caution, thinks that the evidence does not satisfactorily prove their connection with Egypt. As regards the Mediterranean relations, he remarks that the more specialised features of the true megalithic system—dolmens, the use of really large stones, and the combination of large orthostatic slabs and corbelled courses of masonry, as found in Malta and Sardinia—do not exist. Possibly further investigation may provide examples of these features, but at present we lack evidence to connect Sinai with the Mediterranean megalithic area.

IN the Journal of the College of Agriculture of the Imperial University, Sapporo, Japan (vol. vi., pt. vii.), Mr. J. Yamare discusses the inheritance of "notched" ears in Ayrshire cattle. This marked abnormality recognised in American herds of the breed is due to a Mendelian dominant factor, but it is of interest to find that heterozygote individuals show the "notching" only in a greatly reduced condition.

STUDENTS of the Dragonflies will welcome Mr. Clarence H. Kennedy's "Notes on the Life-history and Ecology of the Odonata of Washington and Oregon" (Proc. U.S. Nat. Mus., vol. xlix, pp. 259-345). The habits of the insects when pairing and egg-laying are described, and structural details of the nymphs and of the imagos at different ages are made clear by means of an excellent set of illustrations.

DR. A. E. CAMERON has spent a year in New Jersey as a research fellow of the Victoria University, Manchester, and gives some of the results of his studies in an article on potato spraying and dusting, published in the Bulletin of Entomological Research (vol. vi., part i.). It is established that Bordeaux mixture with arsenate, in addition to its effect as a fungicide, kills the beetle-enemies of the potato crop. Dr. Cameron directs especial attention to the profitable co-operation found in the United States between scientific experts, farmers, and chemical manufacturers, and wishes that similar conditions might be brought about in this country.

THE trustees of the British Museum have issued an account of the Nemertine Worms collected on the *Terra Nova* Antarctic Expedition (Nat. Hist. Report, Zoology, vol. ii., No. 5), by Mr. H. A. Baylis. The number of species is small, and most of them are represented by few examples, but the author in his systematic and anatomical descriptions and drawings has made the most of the material at his disposal. Worms from Antarctic localities described by other naturalists as species of Cerebratulus and Eupolia, are all referred to M'Intosh's Kerguelen species *Lineus corrugatus,* which, on this view, has an extensive circumpolar range.

A VALUABLE account of the penguins of South Georgia, by Mr. R. C. Murphy, has been published, in the form of a bulletin (vol. ii., No. 2) by the Brooklyn Institute of Arts and Sciences. The charge of wanton slaughter, which the author makes against the crew of the *Daisy*, a sealing brig which he accompanied for the purpose of studying the penguin rookeries, makes painful reading. It would seem that the doom of the king penguin, so far as South Georgia is concerned, is sealed. In addition to his studies of this bird, Mr. Murphy gives some lengthy notes on the Gentoo penguin (*Pygoscelis papua*). Since so much has already been written on these birds, more than Mr. Murphy seems to be aware of, judging from his references to the literature of this subject, it is not surprising to find that the author has nothing new of importance to record. In one particular he has missed a fine opportunity. We have heard much of the central "pouch" and of the "flap of skin" under which the king penguin incubates its egg, and later broods its young, but so far no really careful, or accurate, description of this structure has yet been given. Mr. Murphy has done nothing to help forward the solution of this matter.

THE Geological Survey of Great Britain describes the mainland portions of Sheets 330 and 331 in a memoir by H. J. O. White on "The Geology of the Country near Lymington and Portsmouth" (1915, price 1*s*. 6*d*.). The district includes the admirably fossiliferous strata of Bracklesham and the Oligocene beds of Brockenhurst, where a band occurs in the Headon series that is more purely marine than its representative in the Isle of Wight. It is stated that the drowned valley of the Solent and the inlets near Portsmouth generally have been considerably enlarged by marine erosion.

THE United States National Museum has received from a marine Miocene formation in California the greater part of the skull of the rare Sirenian Desmostylus, which shows that in several respects this is one of the most primitive genera of its order. The snout is not bent downwards so much as in modern sirenians, and the nostrils are comparatively small and far forwards The new specimen is described in detail by Dr. O. P. Hay in the Proceedings of the United States National Museum, No. 2113, and reference is also made to an allied species found on the opposite coast of the Pacific in Japan.

THE difficulty of restoring extinct reptiles, even when nearly complete skeletons are known, is well illustrated by the armoured dinosaur Stegosaurus, described by Mr. C. W. Gilmore in a recent part of the Proceedings of the United States National Museum (No. 2110). When Marsh first found the greater part of a skeleton of this reptile, he supposed that its large plates of bony armour were arranged as a ridge along the middle of the back; subsequent authors recognised that the plates were not median, and regarded them as forming a paired series; Mr. Gilmore now concludes that the plates were neither median nor paired, but must have formed two alternating series along the middle of the back. He also thinks that the largest plates were above the root of the tail, not above the pelvis, and thus he feels obliged to make the trunk shorter than in previous restorations. A readjustment of the head gives to Stegosaurus the appearance of a browsing animal.

THE *American Journal of Science* for September, 1915 (vol. xl., No. 237), contains two papers of special geological interest. W. M. Davis gives the results of his studies, during 1914, of the coral-reefs of the Pacific, and strongly supports the theory put forward by C. Darwin "when he was twenty-five years old and before he had ever seen a true coral-reef." W. H. Twenhofel discusses the making of black shale, such as that in which graptolites abound. He shows, from a remarkable instance on the Esthonian coast, described by several Russian writers, that black slimes are not necessarily deposits of deep water, but may fill up coastal shallows. The blackness is in this case due to hydrocarbons of vegetable origin; the absence of tides, and a cool temperate climate are favouring conditions. "Sulphur gas" is present, and the author believes that animal remains would ultimately be pyritised in such an environment. Anærobic bacteria probably play a large part in the production of the slime. The muds of the Black Sea are contrasted with these shore-deposits.

THE August number of *The Royal Engineers' Journal* (vol. xxii., No. 2) contains a lengthy summary of General Maitrot's study of the strategical relations of France and Germany. The original appeared in French in a third edition this year as "Nos Frontières de l'Est et du Nord," and while in the main it deals with military considerations, contains a valuable study of the geography of the western theatre of war. Major W. A. J. O'Meara's summary is accompanied by several useful maps from the original publication. Events have proved the accuracy of General Maitrot's estimate of the value of the geographical factor in the plan of campaign.

INVESTIGATIONS of ocean currents around Australia have been made by floats thrown overboard from various vessels. A chart indicating the drift of fifty of those which have been recovered from the end of 1909 to the middle of 1914 has been published by the Commonwealth Government. Most noticeable is the

E.N.E. course of those set adrift in the forties in contrast to the general E.S.E. track of those from the thirties south of Australia. As most of the floats were cast up on relatively unfrequented shores where they may have lain a considerable time before discovery, it is impossible to form any estimate of their rate of travel. Nor can any conclusions be drawn from the absence of floats on a coast, as, for example, the western coast of the south island of New Zealand, where none have been found; this may be due to that coast being less frequented than the western coast of the north island, where many were picked up.

THE rainfall in Australia in 1914 is shown in a series of charts prepared by Mr. H. A. Hunt, and issued by the Commonwealth Government. The year was noticeable for its drought, and in South Australia, the Riverina, western Victoria, and much of Tasmania it was the driest year on record. These conditions resulted in a failure of the crops over the greater part of the wheat belt, with a production only some 30 per cent. of the previous season. Tasmania suffered least of all parts of the wheat belt, but in other parts of southern Australia the deficiency of rain in the cool part of the year averaged from 25 per cent. to 72 per cent. These conditions were related to anti-cyclones of great intensity, which kept south of their normal track across Australia, and moved very slowly, with the result that the "Antarctic" disturbances failed to reach Australia to any great extent. The weakness and failure of the winter rains were partly counterbalanced in the warmer months by unusually strong monsoons. In western Australia, Victoria, central and southern New South Wales in November and December, these rains were far above the average. On the whole, the drought of 1914 was not so widespread as the droughts of 1888 and 1902, but was locally more intense. Queensland and tropical Australia largely escaped.

IN the *Tôhoku Mathematical Journal* (viii., 1) Mr. Kihizi Yanagihara, in a note entitled "A Theorem on Surface," offers a proof of the statement that if one surface always cuts a second surface in a plane curve or several simply closed plane curves, then the first surface must be a sphere.

IN a paper on "General Expression for Stress Components" (Proceedings of the Tokyo Mathematical Physical Society, viii., 2 (1915)), Mr. Senien Yokota considers the problem of an infinite plate containing a circular hole in which a plug can be inserted, or having complete or partial contact with its periphery. The plate is supposed to be under a uniform tension in a fixed direction. It would appear that whether the plug is loose or just fits the hole, the maximum tangential tension on the periphery of the hole is three times the tension applied to the plate. This result is no doubt of interest in connection with the problem of rivets.

IT is remarkable that while aeroplanes the engines of which have been disabled by shrapnel can pursue their erratic paths to earth without any prospect of having their equations of motion solved, mathematicians are still covering pages of formulæ with attempts to solve the problem of three (hypothetical) bodies. We have before us a paper by Prof. T. Levi Civita on "The Reduction of the Problem of Three Bodies" (Venice: Carlo Ferrari, 1915; reprinted from the *Atti del R. Istituto Veneto*, lxxiv., 2, pp. 907–939), and Mr. D. Buchanan discusses a new isosceles solution in the Transactions of the American Mathematical Society, xvi., 3, pp. 259–274. We can only hope that these and other writers on this problem will speedily bring their investigations to such a state of perfection as to render it impossible to discover anything further on the subject. When this is done, they will find aeroplanes clamouring for a little attention.

IN response to numerous requests for information as to the melting points of the chemical elements, the Bureau of Standards at Washington has issued a table of melting points according to the most trustworthy data. The following are the melting points on the thermodynamic scale used by the bureau as standard temperatures in the standardisation of thermometers and pyrometers: Mercury −38·9°, tin 231·9°, cadmium 320·9°, lead 327·4°, zinc 419·4°, antimony 630·0°, aluminium 658·7°, silver 960·5, gold 1063·0°, copper 1083·0°, nickel 1452°, iron 1530°, palladium 1549°, platinum 1755°, tungsten 3000°. At temperatures of 1000° the uncertainty is of the order 0·1°, at platinum 5°, and at tungsten 100° C. A further table of other standard temperatures is given in which the following are included: normal boiling point of oxygen −183·0°, sublimation of carbon dioxide in an inert liquid −78·5°, normal boiling points of water 100°, naphthalene 217·96°, benzophenone 305·9°, sulphur 444·6°, freezing point of sodium chloride 801° C.

THERE is an interesting description with photographs in *Engineering* for October 1 of what is in many respects the most remarkable old steam engine in existence. This is a Newcomen engine used at the Farme Colliery, Rutherglen, near Glasgow. The valve gear is of the simplest possible kind, and is worked by hand, just as was the case with the original Newcomen engine. The engine is used for winding, and draws a cage up in 35 seconds, making 16 revolutions while doing so. The cylinder has a diameter of 2 ft. 8¼ in., and the stroke is 5 ft. 6 in. The mean pressure is 7·35 lb. per sq. in., and the boiler pressure is 3 lb. per sq. in. The maximum indicated horse-power is 27.

IN addition to the works referred to in the last two numbers of NATURE, the following forthcoming books of science are announced:—In *Agriculture*—The Spirit of the Soil: An Authorised Exposition of the Theories and Results evolving from Prof. Bottomley's Inoculation of Soil by Means of Bacteria, G. D. Knox, illustrated (Constable and Co., Ltd.); Poultry Husbandry, E. Brown, illustrated (E. Arnold). In *Anthropology and Archaeology*—Savage Man of Central Africa, Dr. A. L. Cureau (T. Fisher Unwin, Ltd.). In *Biology*—The Hill Birds of Scotland, S. Gordon, illustrated; Thirty-five Years in the New Forest, Hon. G. Lascelles, illustrated (E. Arnold); Trout Fly-Fishing in

America, C. Z. Southard, illustrated; The Rambles of a Canadian Naturalist, S. T. Wood, illustrated (J. M. Dent and Sons, Ltd.); Bramble-Bees, J. H. Fabre (Hodder and Stoughton); Bird Behaviour, F. Finn; Insect Artisans and their Work, E. Step (Hutchinson and Co.); The Book of the Wilderness and Jungle, F. G. Aflalo; Wild Animals of Yesterday and To-Day, F. Finn; The Common Beetles of our Countryside, W. E. Sharp (S. W. Partridge and Co.); Wonders of Animal Life, W. S. Berridge (Simpkin and Co., Ltd.). In *Geography and Travel*—By Forest Ways in New Zealand, F. A. Roberts, illustrated (Heath, Cranton and Co., Ltd.); Java: Past and Present, D. Campbell, 2 vols., illustrated (Heinemann); How to Read Ordnance Maps, J. F. Unstead; Philip's Human Geographies, H. Fairgrieve and E. Young (G. Philip and Son, Ltd.); With Scott: the Silver Lining, T. G. Taylor, illustrated (Smith, Elder and Co.). In *Geology*—Earth-Lays: Geological and other Moods, C. Tolly (J. M. Dent and Sons, Ltd.). In *Mathematical and Physical Science*—Text-Book of Navigation and Nautical Astronomy, Capt. A. P. W. Williamson, new edition, illustrated (John Hogg). In *Medical Science*—Mosquito Control in Panama: the Eradication of Malaria and Yellow Fever in Cuba and Panama, J. A. Le Prince and A. J. Orenstein (G. P. Putnam's Sons). In *Technology*—Handbook of Technical Instruction for Wireless Telegraphists, J. C. Hawkhead and H. M. Dowsett, new edition, illustrated (The Wireless Press, Ltd.). In *Miscellaneous*—The Limitations of Science, Prof. L. T. More (Constable and Co., Ltd.); Social Progress and the Darwinian Theory, G. W. Nasmyth; Darwin and the Humanities, Prof. J. Mark Baldwin (G. P. Putnam's Sons).

OUR ASTRONOMICAL COLUMN.

MEASURES OF JUPITER.—Numerous visual and photographic measures of the diameter of this planet have been made by the Rev. Father S. Chevalier, S.J., of the Zô-Sé Observatory, during 1912–13 (*Mem. Soc. Spett. Ital.*, July, 1915). The Gautier micrometer used in the visual work provides for the measures being made by bringing two strips of platinum tangential to the limbs of the planet, either (i) internally, *i.e.* with both strips seen in front of the disc, or (ii) externally, both strips beyond the disc. The two sets of measures thus obtained were of closely similar accuracy. In the photographic work very many separate exposures were made on each plate, affording material for a considerable body of measures. The exposures were graded in seven groups according to intensity, and measures on only four of these sets were used in taking the means. The discarded groups were those in which the images were considered either too small through under-exposure or enlarged by irradiation. The mean results may be summarised as follows:—

	Polar diam.	Equat. diam.
Visual measures ...	35·37″	38·16″
Photographic measures	35·20″	37·99″

The value of the aplatissement derived from both sets is practically identical, its reciprocal being 13·6, indicating a decidedly greater flattening than hitherto ascribed to this planet. Thus in one of the most important memoirs recently published (Lau, *Ast. Nach.*, No. 4673) the diameters are given as 35·4″ and 37·6″, yielding 17 as the reciprocal of the ellipticity.

THE ROTATION PERIOD OF CERTAIN JOVIAN MARKINGS.—Jupiter is now well situated for observation, and Mr. W. F. Denning, in the Journal of the Royal Astronomical Society of Canada (September), indicates some directions in which useful work may be done. The subject of the paper is the rotation period of the great red spot and of the hollow in the southern equatorial belt. The yearly values of the rotation period are tabulated for the eighty-four years, 1831–1914 (inclusive). Waiving the debatable point involved in the formation of this sequence, the period has varied between 9^{h}. 55^{m}. 33·3^{s}. (1831) and 9^{h}. 55^{m}. 41·7^{s}. (1898). Special attention is directed to the very marked acceleration since 1910. The mean period of rotation for about 74,170 rotations comes out at 9^{h}. 55^{m}. 36·9^{s}. After such a weighty determination one hesitates to mention a value based on twenty-nine rotations, but M. Chevalier's recent photographic measures are worthy of note (*Mem. Spett. Ital.*, vol. iv., September 2, p. 113). The point measured was the western extremity of the south tropical disturbance, and the period deduced 9^{h}. 55^{m}. 10·4^{s}. ± 0·7^{s}., a faster movement than Mr. Denning assigns to the dusky south tropical disturbance (9^{h}. 55^{m}. 20^{s}. approx.). The question of co-ordinating the visual and photographic observations would no doubt in happier times have led to extensive polemics.

R. CORONÆ BOREALIS.—This irregular variable has been manifesting light-changes during the past summer (see this column, August 19). We now learn from the Monthly Register of the Society of Practical Astronomy that in Bulletin No. 585 Harvard College Observatory, August 14, 1915, Prof. E. C. Pickering states that attention had been directed to its diminution in brightness by Mr. Eaton, and Mr. Bancroft found its magnitude 6·8 on July 24 and 6·9 on the 25th; whilst at Harvard, on August 13, its magnitude was only 7·7 (Mr. Campbell).

A 10-INCH DIFFRACTION GRATING.—A short paper by Prof. A. A. Michelson on the ruling and performance of a giant diffraction grating (*Proc. Amer. Phil. Soc.*, No. 217, p. 137) affords most inspiring reading. Rowland's gratings accomplished so much, yet the interferometer, the echelon, and the plane parallel plate brought such undreamed-of resolving powers into practical employ that it might well have been imagined that the grating had had its day. Michelson, the pioneer of the newer methods, realised early their disadvantages, and twelve years ago set about constructing a perfect screw 20 ins. in length, with the hope of some day ruling a grating 14 ins. long. Mechanicians will delight in the ingenious devices which have brought realisation within reach, and even encourage the undertaking of a 20-in. grating. Thus for correcting the screw an interferometer method was adapted enabling measurement to within 1×10^{-6} of an inch. An auto-collimating method of straightening the guiding ways ensured rectilinear motions within one second of arc. The grating carriage was nearly floated in mercury. Longitudinal movement of the screw was geometrically eliminated by allowing its spherically rounded end to bear against an optically plane surface of diamond fitted with adjustments to secure normality to the axis of the screw. Periodic errors could be corrected by using a worm-wheel to rotate the screw, and those of higher order were eliminated by a mysterious "correcting device." So long ago as 1910 a 6½-in. grating had been produced and was employed by Messrs. Gale and Lemon in a research demanding resolving powers rivalling those of interference spectroscopes; now a ruled surface 9⅜ in. × 2⅞ in., having 11,700 lines per inch, has been achieved and tested in a spectrograph of the Littrow form with an 8-in. 20-ft. Brashear lens. The